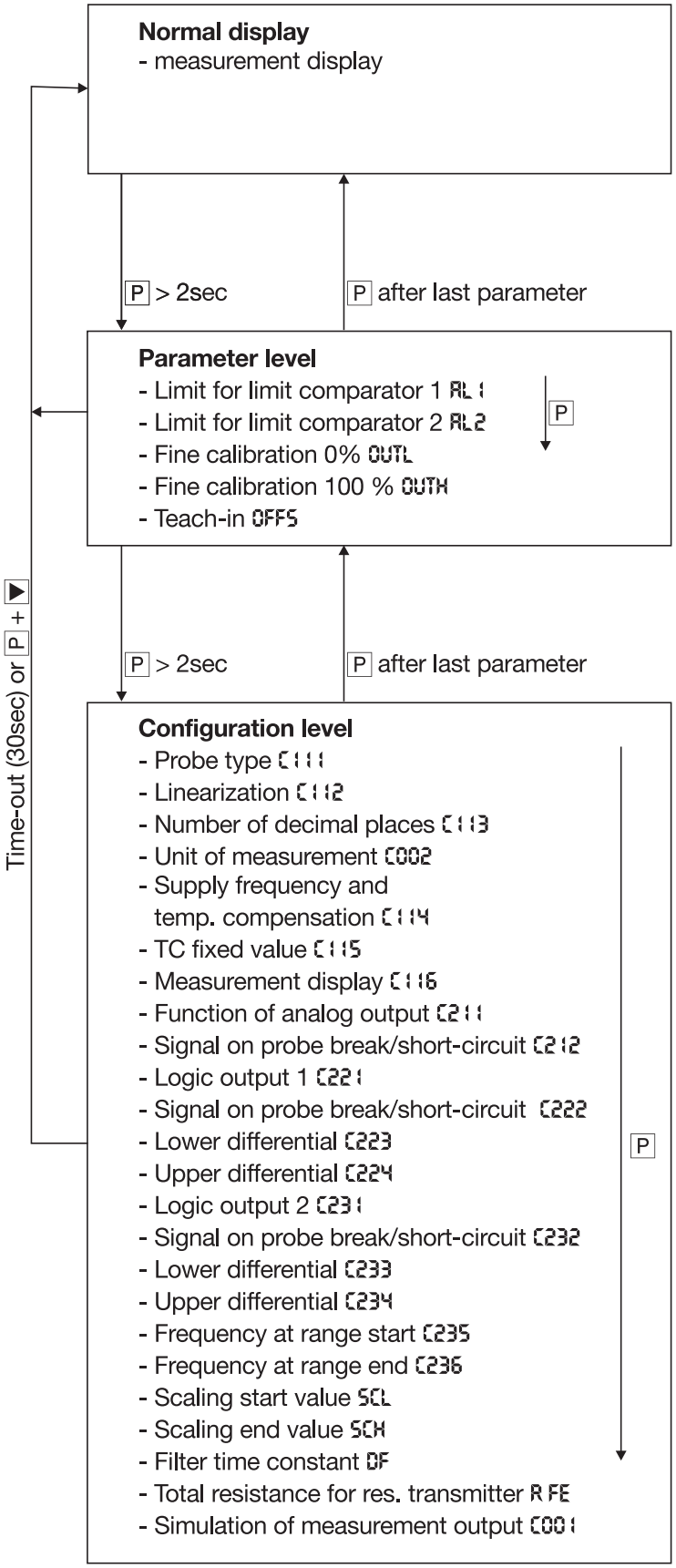
JUMO
dTRANS T02 LCD
programmable transmitter

B 95.6522
Operating Instructions

10.00/00384955

Overview of operation


Normal display
- measurement display
P > 2sec
P after last parameter
Parameter level
- Limit for limit comparator 1 RL1
- Limit for limit comparator 2 RL2
- Fine calibration 0% OUTL
- Fine calibration 100 % OUTH
- Teach-in OFFS
P
P > 2sec
P after last parameter
Time-out (30sec) or P + ▶
Configuration level
- Probe type C111
- Linearization C112
- Number of decimal places C113
- Unit of measurement C002
- Supply frequency and temp. compensation C114
- TC fixed value C115
- Measurement display C116
- Function of analog output C211
- Signal on probe break/short-circuit C212
- Logic output 1 C221
- Signal on probe break/short-circuit C222
- Lower differential C223
- Upper differential C224
- Logic output 2 C231
- Signal on probe break/short-circuit C232
- Lower differential C233
- Upper differential C234
- Frequency at range start C235
- Frequency at range end C236
- Scaling start value SCL
- Scaling end value SCH
- Filter time constant DF
- Total resistance for res. transmitter RFE
- Simulation of measurement output C001
P

1 Type designation

JUMO dTRANS T02 LCD

		(1)	**Basic version**
	956522		programmable transmitter
		(2)	**Input (programmable)**
x	888		factory-set (Pt100 DIN vl / 0 — 100°C)
x	999		configuration to customer specification[1]
		(3)	**Output (proportional DC current - programmable)**
x	888		factory-set (0 — 20mA)
x	999		configuration to customer specification (0/4 — 20mA or 0/2 — 10V)
		(4)	**Supply**
x	22		20 — 53V AC/DC 48 — 63Hz
x	23		110 — 240V AC +10/-15% 48 — 63Hz

	(1)		(2)		(3)		(4)
Order code		/		-		-	
Order example	**956522**	**/**	**888**	**-**	**888**	**-**	**23**

1. For configuration to customer specification, probe type and range have to be specified in plain text.

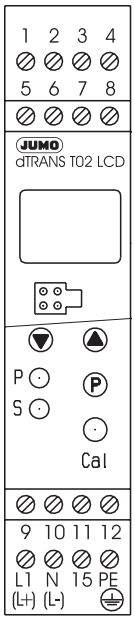
Standard accessory

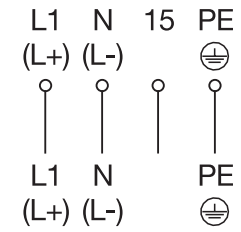
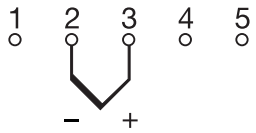
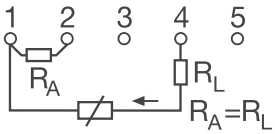
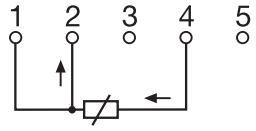
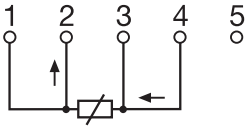
- 1 Operating Instructions 95.6522

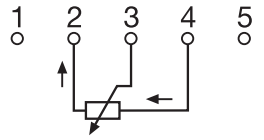
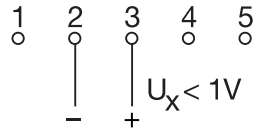
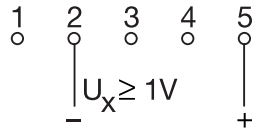
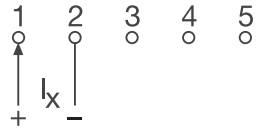
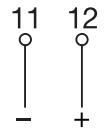
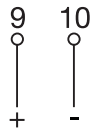
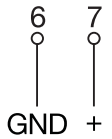
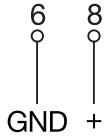
Accessories

- PC setup program, multilingual
- PC interface cable with TTL/RS232 converter and adapter

Connection diagram



Connection for	
Supply	
Analog inputs	
Thermocouple	
Resistance thermometer / potentiometer in 2-wire circuit $R_L \leq 30\,\Omega$ (R_L = total lead resistance)	
Resistance thermometer / potentiometer in 3-wire circuit	
Resistance thermometer / potentiometer in 4-wire circuit	

Resistance transmitter in 3-wire circuit	
Voltage input < 1 V	
Voltage input ≥ 1 V	
Current input	
Analog outputs	
Voltage output	
Current output	
Digital outputs	
Open-collector output 1 (see “Connection examples” on page 28)	
Open-collector output 2 (see “Connection examples” on page 28)	

2 Installation

Installation notes

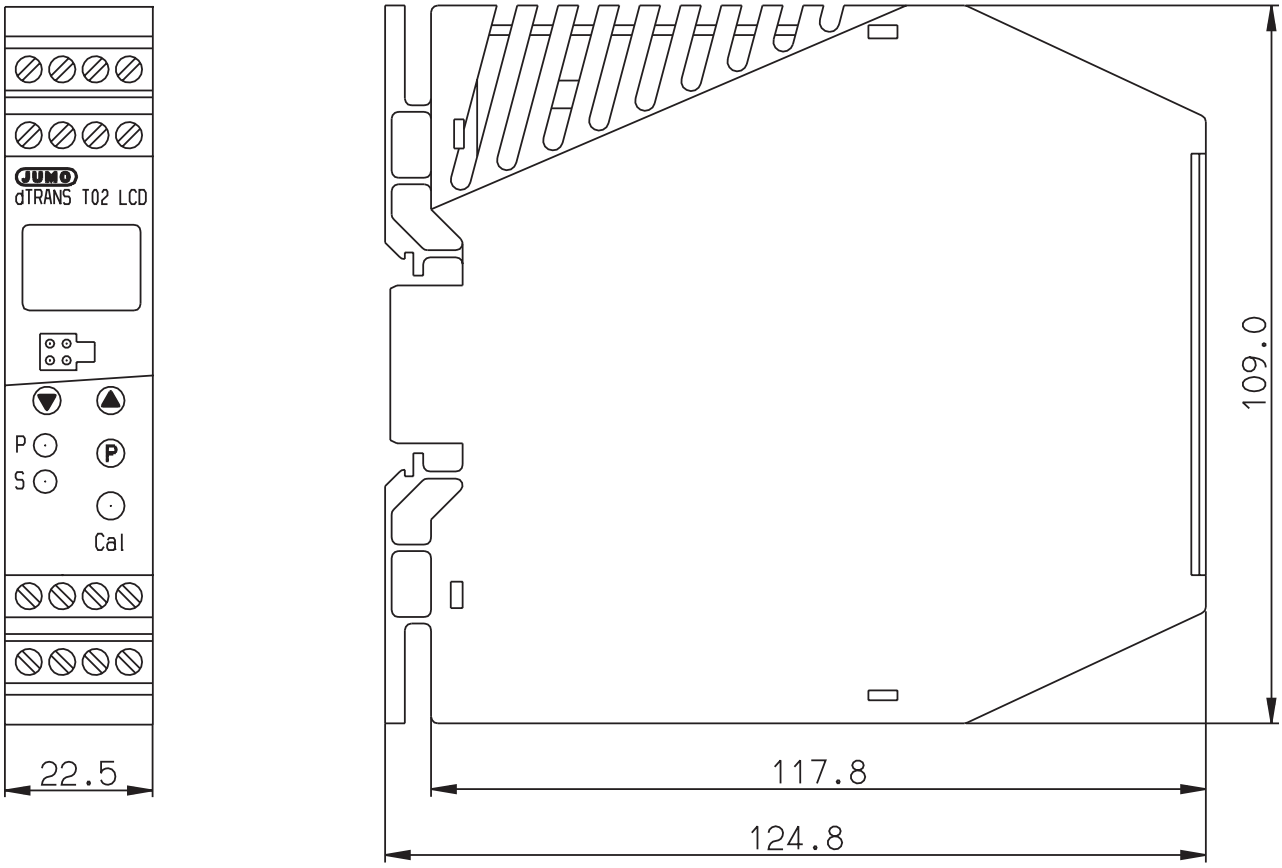
- The choice of cable, the installation and the electrical connections must conform to the requirements of VDE 0100 “Regulations for the installation of power circuits with nominal voltages below 1000V”, or the appropriate local regulations.
- The electrical connection, as well as work inside the unit, must only be carried out by qualified personnel.
- Ensure that the instrument is completely isolated from the supply before carrying out work where live components may be touched.
- A current limiting resistor (safety function) interrupts the supply circuit in the transmitter in the event of a short-circuit. The external fusing of the supply voltage should not be rated above 1A (slow).
- Avoid magnetic or electric fields, such as caused by transformers, mobile phones or electrostatic discharge in the vicinity of the instrument[1].
- Do not install inductive loads (relays, solenoid valves etc.) close to the instrument. Use RC networks, spark quenchers or freewheel diodes for interference suppression.
- Route input, output and supply cables separately, and not parallel to each other. Run out and return cables next to each other and twisted, if possible.
- Probe cables must be twisted and shielded. Do not run them close to current-carrying cables or components. Earth the shielding at one end on the instrument.
- Do not connect any additional loads to the supply terminals of the instrument.

2 Installation

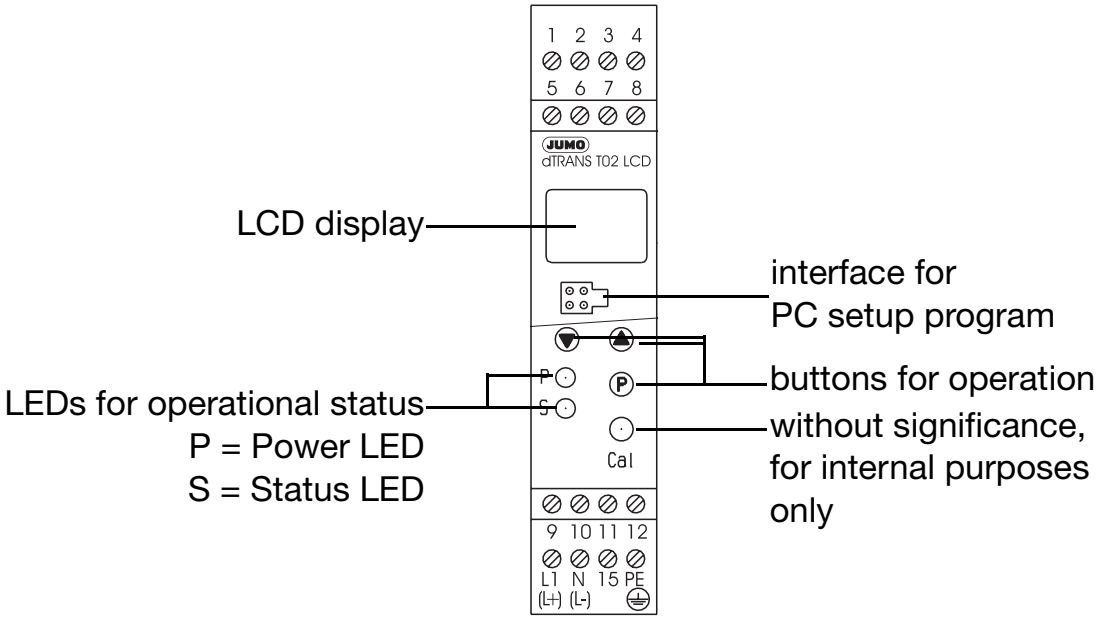
- The instrument is not suitable for installation in areas with an explosion hazard.
- Any electrical connection which deviates from the connection diagram may result in the destruction of the instrument.
- In supply networks that are subject to interference (e.g. thyristor controls), the instrument should be supplied via an isolating transformer.
- Supply fluctuations are only permissible within the specified tolerances[1].

1. see Data Sheet

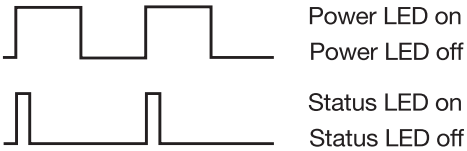
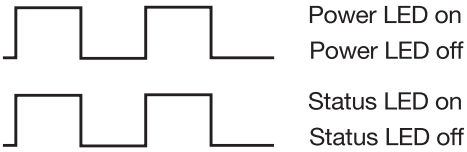
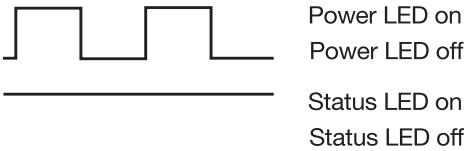
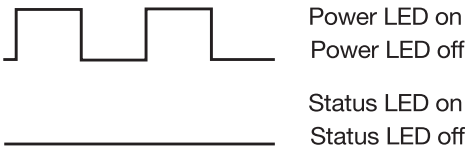
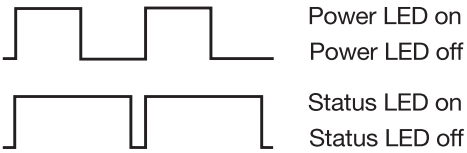
Dimensions



3 Displays and controls



Operational status at the operating level (normal operation)	**Illumination/blink behavior**
Limit comparator 1 inactive 2 inactive	Power LED on Power LED off Status LED on Status LED off
Limit comparator 1 active 2 inactive	Power LED on Power LED off Status LED on Status LED off
Limit comparator 1 inactive 2 active	Power LED on Power LED off Status LED on Status LED off
Limit comparator 1 active 2 active	Power LED on Power LED off Status LED on Status LED off
Overrange	Power LED on Power LED off Status LED on Status LED off

Operational status at the parameter level (programming mode)	Illumination/blink behavior
Limit for limit comparator 1	
Limit for limit comparator 2	
Fine calibration (zero)	
Fine calibration (full scale)	
Teach-in (0 % value)	

Differentiation of the operational states

- in the **Operating level** status, the power LED is on permanently.
- in the **Parameter level** status, the power LED blinks (equally on and off).

4 Functions and operation

You can operate and program the transmitter by using the P, ▼ and ▲ buttons in conjunction with the LCD display and the blink cycles of the "Power" and "Status" LEDs, which have already been described in Chapter 3 "Displays and controls".

In use, three operating states can be distinguished:

- Operating level (normal operation)
- Parameter level (programming mode)
- Configuration level (programming mode)

Operating level

The transmitter is at the operating level 2 seconds after power-on, or after leaving the parameter or configuration level.

Parameter level

From the operating level, you can access the parameter level by pressing the P button (for at least 2 seconds). The following functions can be programmed at this level:

- Limit value for limit comparator 1 — AL1
- Limit value for limit comparator 2 — AL2
- Fine calibration (zero point - 0%) — OUTL
- Fine calibration (full scale - 100%) — OUTH
- Teach-in — OFFS

The parameter level is exited (quit)

- after editing the "Teach-in" parameter,
- if no button has been pressed for at least 20 seconds,
- or by pressing the button combination P + ▼.

The individual parameters can be altered, one after another. You can step from one parameter to the next by pressing the P button.

Configuration level

You can access the configuration level from the parameter level by pressing the P button (for at least 2 seconds).

☞ The parameters can only be modified when the parameter OFFS is active in the display and the configuration level has been started. If another parameter is active, you can only read the current setting.

The following functions can be programmed at this level:

- Probe type C111
- Linearization C112
- Number of decimal places C113
- Unit of measurement C002
- Supply frequency and temperature compensation C114
- Fixed value for temperature compensation C115
- Measurement display C116
- Function of the analog output C211
- Signal on probe break/short-circuit C212
- Function of the logic output 1 C221
- Signal on probe break/short-circuit C222
- Lower switching differential (hysteresis) C223
- Upper switching differential (hysteresis) C224
- Function of the logic output 2 C231
- Signal on probe break/short-circuit C232
- Lower switching differential (hysteresis) C233
- Upper switching differential (hysteresis) C234

- Frequency at the range start C235
- Frequency at the range end C236
- Start value for scaling SCL
- End value for scaling SCH
- Filter time DF
- Total resistance for resistance transmitter R FE
- Simulation of measurement output C001

The configuration level is exited (quit)

- after editing the last parameter,
- if no button has been pressed for at least 20 seconds,
- or by briefly pressing the button combination P + ▼.

The individual parameters can be altered, one after another. You can step from one parameter to the next by pressing the P button.

Incrementing values

When programming the parameters, the ▲ button is used to increase a value (+).

Decrementing values

When programming the parameters, the ▼ button is used to decrease a value (-).

Accepting values

If a setting has been altered, the P button has to be pressed to accept the alteration.

P has a twofold function:

- Acceptance of altered values

- Calling the next parameter

Value check

With the exception of the parameters OUTL, OUTH and OFFS, all present values can be checked during programming with the aid of the LCD display. A voltmeter can be used at the voltage output, as an additional check.

☞ If the parameter level is active, the analog output will not be operated according to the input circuit connection when programming the two limit values, but with the momentary limit value.

☞ Please note that the programming of the “Teach-in” parameter deviates from the standard operation.

See “Teach-in” on page 14.

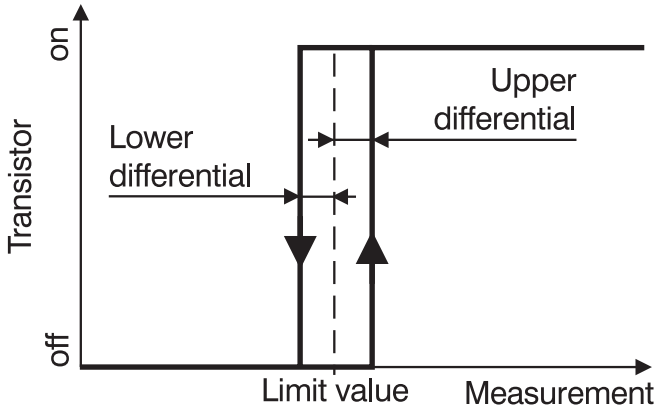
Setting the limit values (limit comparators)

You can alter the two limit values AL1 and AL2 by using the ▼ and ▲ buttons. The momentary value will be produced via the output. The value is accepted by pressing the P button.

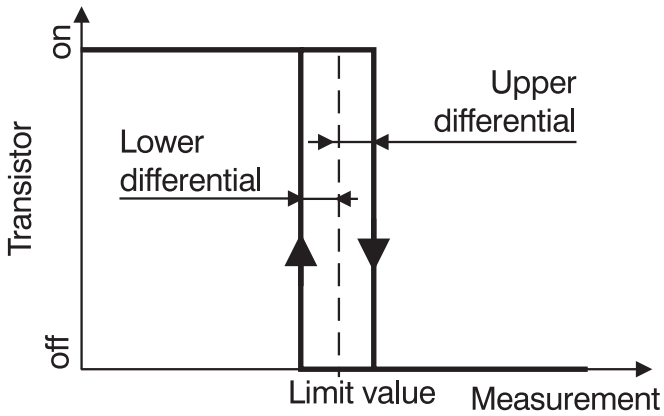
The switching differential (hysteresis) can be set using the parameters C223 and C224 or C233 and C234.

Two functions are available for limit monitoring. With the help of the parameter C221 or C231, you can decide which one to use.

Function lk7:



Function lk8:



Of course, all parameters can also be set using the PC setup program, which is available as an extra code.

Fine calibration (zero point and full scale)

Fine calibration can be used to adjust the zero point and the slope of the output signal. Here, too, the ▼ and ▲ buttons are available for altering the appropriate value, and for accepting it by pressing the P button.

The converted value is produced at the output. At zero point (OUTL), this should correspond to the output signal 0 %, at full scale (OUTH), to the output signal 100 %.

The formula for calculating the new (converted) value is:

output (converted) value = measurement (input) $value_{scaled}$ x full scale + zero point

Teach-in

The “Teach-in” parameter serves to define the 0% value.

During programming, the zero point is produced at the output (e.g. 4mA). This value is accepted by pressing the ▼ **or** ▲ button and executed with P. After a time-out without acceptance, the old value will be available again.

Example:

The position of a valve is detected by a potentiometer. The potentiometer covers the range 50 to 150Ω, with 50Ω corresponding to the valve closed. The range is programmed as follows:

- Potentiometer 50 — 150 Ω
- Output 0 — 20mA

The following is assumed:

However, because of mechanical tolerances, the potentiometer position with the valve closed is 52Ω, which results in an output current of 0.4mA. Thanks to the “Teach-in” function, this error can be eliminated as described below:

- Close valve
- Call the parameter level and select OFFS
  (0.4mA should then be present at the output).
- Press the ▼ **or** ▲ button – the output must now
  change to 0mA.
- Confirm alteration by pressing P.
- Exit the parameter level (either after a time-out of 20sec or by simultaneously pressing P + ▼.

5 Configuration and parameter tables

You can record your settings in the configuration and parameter tables below, in the position (column) marked with ✎. The factory settings are shown on a gray background ( ).

Parameters at the parameter level

Parameter	**Explanation**	**Value range**	**factory setting**	X✎
AL1	Limit value of limit comparator 1	-1999 to +9999 digit	0	
AL2	Limit value of limit comparator 2	-1999 to +9999 digit	0	
OUTL	Fine calibration 0% (zero)	see “Fine calibration (zero point and full scale)” on page 13		
OTUH	Fine calibration 100% (full scale)	see “Fine calibration (zero point and full scale)” on page 13		
OFFS	Teach-in	see “Teach-in” on page 14		

Parameters at the configuration level

Measurement input

CIII	**Transducer**	X✎
0	Resistance thermometer in 3-wire circuit	
1	Resistance thermometer in 4-wire circuit	
2	Resistance thermometer in 2-wire circuit	
3	Thermocouple	
4	Voltage up to 1000mV	
5	Voltage up to 10V	
6	Current	
7	Resistance transmitter	
8	Potentiometer 3-wire circuit	
9	Potentiometer 4-wire circuit	
10	Potentiometer 2-wire circuit	

C12	**Linearization**	X✎
0	linear	
1	customized	
2	Pt 100 DIN	
3	Pt 500 DIN	
4	Pt 1000 DIN	
5	Pt 100 JIS	
6	Ni 100	
7	Ni 500	
8	Ni 1000	
9	Type L	
10	Type J	
11	Type U	
12	Type T	
13	Type K	
14	Type E	
15	Type N	
16	Type S	
17	Type R	
18	Type B	
19	Type D	
20	Type C	

C13	**Number of decimal places**	X✎
0	no decimal place	
1	1 decimal place	
2	2 decimal places	

C002	**Unit of measurement** (only effective if parameter C116 = 2 see page 21		X
	Unit	**LCD display**	
0	°C	°C	
1	°F	°F	
2	K	K	
3			
4	bar	BAR	
5	mbar	mBAR	
6	Pa	PA	
7	kPa	KPA	
8	s	SEC	
9	ms	mSEC	
10	min	min	
11	h	H	
12	d	d	
13	100ms	100mS	
14	ml/s	mL/S	
15	ml/min	mL/mn	
16	l/s	L/SEC	
17	l/min	L/min	
18	l/h	L/H	
19	m³/s	m3/S	
20	m³/min	m3/mn	
21	m³/h	m3/H	
22	1/s	1/SEC	
23	1/min	1/min	
24	1/h	1/H	
25	Hz	HZ	
26	kHz	KHZ	
27	MHz	MHZ	
28	lx	LX	

C002	**Unit of measurement** (only effective if parameter C116 = 2 see page 21		X
	Unit	**LCD display**	
29	mlx	mLX	
30	klx	KLX	
31	cd	cd	
32	mcd	mcd	
33	kcd	Kcd	
34	µm	µm	
35	mm	mm	
36	cm	cm	
37	m	m	
38	km	Km	
39	%	%	
40	‰	‰	
41	ppm	PPM	
42	ppb	PPB	
43	µg	µG	
44	mg	mG	
45	g	G	
46	kg	KG	
47	t	T	
48	µW	µW	
49	mW	mW	
50	W	W	
51	kW	KW	
52	MW	MW	
53	mVA	mVA	
54	VA	VA	
55	kVA	KVA	
56	mVAs	mVAS	
57	VAs	VAS	

C002	**Unit of measurement** (only effective if parameter C116 = 2 see page 21		X
	Unit	**LCD display**	
58	kVAs	KVAS	
59	J	J	
60	µJ	µJ	
61	mJ	mJ	
62	kJ	KJ	
63	Ws	WS	
64	kWh	KWH	
65	pH	PH	
66	mΩ	mOHM	
67	Ω	OHM	
68	kΩ	KOHM	
69	MΩ	MOHM	
70	mm/s	mm/S	
71	mm/h	mm/H	
72	m/s	m/SEC	
73	m/min	m/MIN	
74	km/h	Km/H	
75	%/s	%/S	
76	m/s^2	m/S2	
77	G	G	
78	µl	µL	
79	ml	mL	
80	l	L	
81	hl	HL	
82	m^3	M3	
83	µV	µV	
84	mV	mV	
85	V	V	
86	kV	KV	

C002	**Unit of measurement** (only effective if parameter C116 = 2 see page 21		X
	Unit	**LCD display**	
87	µA	µA	
88	mA	mA	
89	A	A	
90	kA	KA	
91	S	S	
92	mS	mS	
93	µS	µS	
94	nH	nH	
95	µH	µH	
96	mH	mH	
97	H	H	
98	pF	PF	
99	nF	nF	
100	µF	µF	
101	mF	mF	
102	F	F	
103	mm²	mm2	
104	cm²	cm2	
105	m²	m2	
106	km²	Km2	
107	kg/l	KG/L	
108	g/l	G/L	
109	N	N	
110	mN	mN	
111	kN	KN	
112	Nm	Nm	
113	Nmm	Nmm	
114	Nkm	NKm	
115	µV/K	µV/K	

C114	**Supply frequency/temperature compensation**	X✎
0	50Hz / internal temperature compensation	
1	50Hz / fixed temperature compensation	
2	60Hz / internal temperature compensation	
3	60Hz / fixed temperature compensation	

Para-meter	**Explanation**	**Value range**	**factory setting**	X✎
C115	value with fixed temperature compensation	0 — 100°C	0	

C116	**Measurement display**	X✎
0	percent	
1	as output signal (mA or V)	
2	in configurable unit (see parameter C002 page 17)	

Analog output

C211	**Function of the analog output**	X✎
0	0 — 20mA	
1	4 — 20mA	
2	0 — 10V	
3	2 — 10V	
The limits can be inverted by swapping the two parameters SCL and SCH.		

C212	**Signal of output on probe break/short-circuit**	X✎
0	positive (22mA or 11V - according to C211)	
1	negative (0mA or 0V - according to C211)	

Logic output 1

C221	**Function of the logic output 1**	X✎
0	no function	
1	lk7	
2	lk8	
3	fault output	
You will find additional information on lk7 and lk8 in “Setting the limit values (limit comparators)” on page 12.		

C222	**Signal of logic output 1 on probe break/short-circuit**	X✎
0	active	
1	inactive	
2	unchanged	

Para-meter	**Explanation**	**Value range**	**factory setting**	X✎
C223	Lower switching differential (hysteresis)	0 — 250	100	
The value range corresponds to 0 — 2.5 %.				

Para-meter	**Explanation**	**Value range**	**factory setting**	X✎
C224	Upper switching differential (hysteresis)	0 — 250	100	
The value range corresponds to 0 — 2.5 %.				

Logic output 2

C231	**Function of the logic output 2**	X
0	no function	
1	lk7	
2	lk8	
3	Frequency output	
You will find additional information on lk7 and lk8 in “Setting the limit values (limit comparators)” on page 12.		

C232	**Signal of the logic output 2 on probe break/short-circuit**	X
0	active or frequency C236	
1	inactive or frequency C235	
2	unchanged	

Para-meter	**Explanation**	**Value range**	**factory settting**	X
C233	Lower switching differential (hysteresis)	0 — 250	100	
The value range corresponds to 0 — 2.5 %.				

Para-meter	**Explanation**	**Value range**	**factory setting**	X
C234	Upper switching differential (hysteresis)	0 — 250	100	
The value range corresponds to 0 — 2.5 %.				

Para-meter	**Explanation**	**Value range**	**factory setting**	X
C235	Frequency at range start	10 — 1000 Hz	10	

Para-meter	**Explanation**	**Value range**	**factory setting**	X✎
C236	Frequency at range end	10 — 1000 Hz	1000	

Additional parameters

Para-meter	**Explanation**	**Value range**	**factory setting**	X✎
SCL	Scaling start value	-1999 to +9999 digit	0	
SCH	Scaling end value	-1999 to +9999 digit	100	
DF	Filter time constant	0.0 — 100.0 sec	0.6	
RFE	Total resistance for resistance transmitters	0 — 4000 Ω	1000	
C001	Simulation of measurement output	0 — 110 % (110 = switched off)	110	

... on operation within the parameter and configuration levels

☞ Pressing the [P] button to confirm a value entry requires that a value has previously been modified.

If this is not the case, the confirmation will be interpreted as a call of the next parameter.

☞ If, after an accidental alteration, the value is not to be accepted, just wait for the time-out of 20 sec. Afterwards, the instrument will automatically jump back to normal operation, without accepting the alteration.

☞ Please check that all entered values are correct. The transmitter itself does not check value ranges.

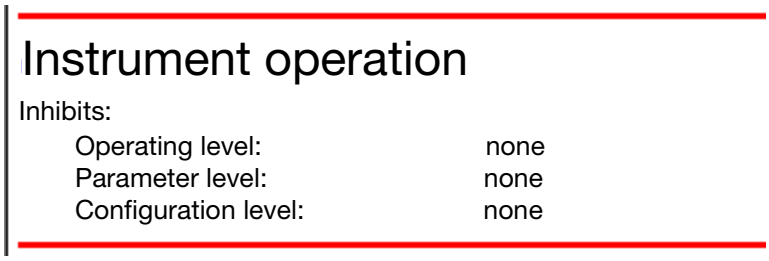
☞ Please note that the programming of the “Teach-in” parameter differs from the standard operation.

see “Teach-in” on page 14.

☞ In order to be able to modify the parameters at the configuration level, the configuration level has to be called up when the display shows the parameter OFFS. If this is not the case, you can read the parameters, but you cannot modify them.

... of a more general nature

☞ If none of the parameters can be modified, then you may have locked the operation on the instrument through the setup program. Please check the setting using the setup program.



The instrument settings can only be modified when “Operating level”, “Parameter level” and “Configuration level” are set to “none”.

☞ Both outputs (current and voltage) are always available at the same time. However, the output that has not been activated only has an accuracy of approx. ± 2 % of full scale.

☝ The frequency output will not be operated as long as the setup interface is active.

:

7 PC setup program

The PC setup program, which is available as an extra, can be used to modify all parameters of the transmitter (including the custom linearization) with ease. Through the setup interface, the transmitter and the PC are linked via the “PC interface with TTL/RS232 converter and adapter”.

Configurable parameters

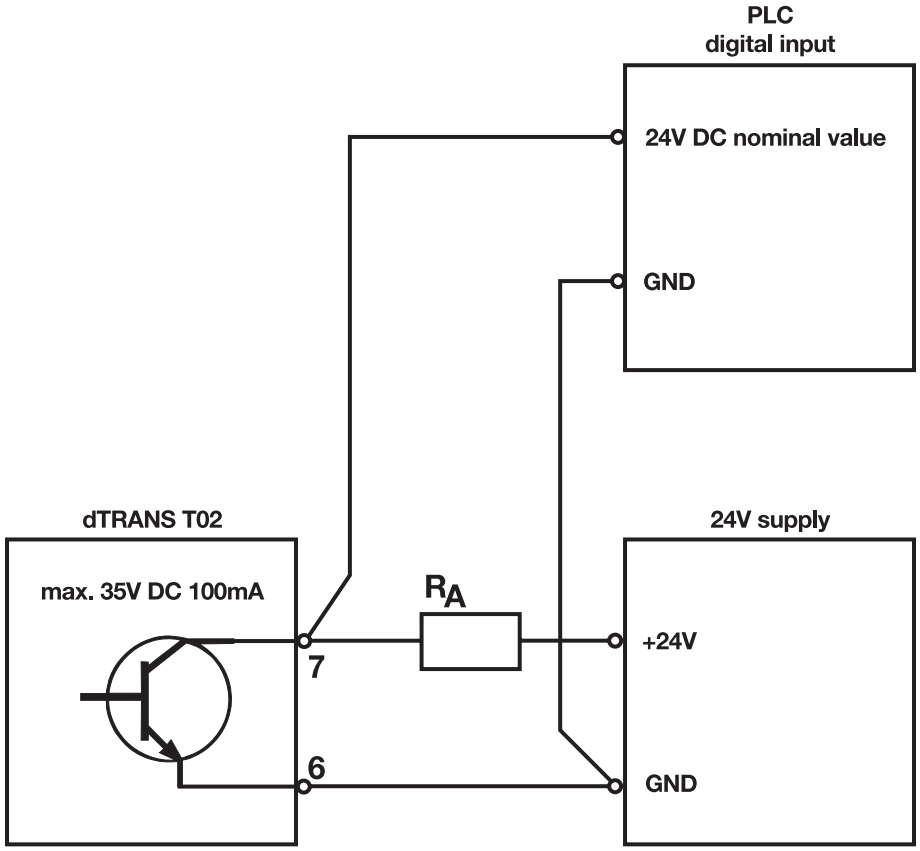
- TAG number (10 characters)
- analog input (sensor type)
- connection circuit (2-/3-/4-wire circuit)
- external or constant cold junction
- custom linearization
- range limits (start and end)
- output signal current/voltage/frequency rising/falling
- digital filter
- response to probe break/short-circuit
- recalibration/fine calibration
- instrument calibration
- limit value/differential of the limit comparators
- file-info text

Additional benefits of the PC setup program

- manage several settings
- one setting for several transmitters
- print out setting for documentation
- operation can be switched to GMA standard

The frequency output will not be operated as long as the setup interface is activated.

Example 1
Connecting a PLC to the open-collector output



Calculation example for R_A (working resistance)

In this example, the following typical PLC characteristics are assumed:

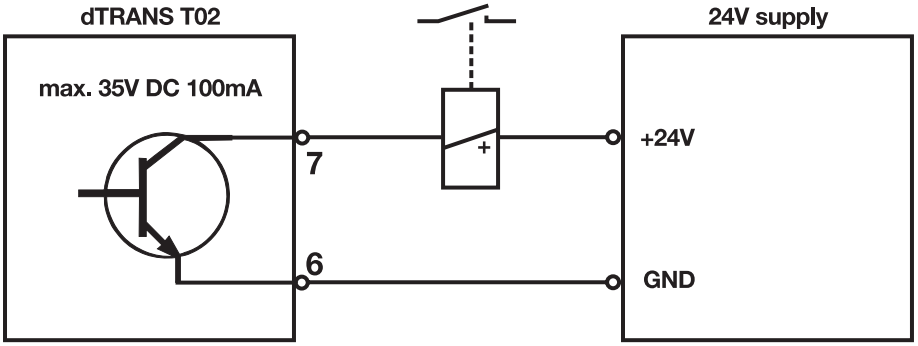
- for signal “1”: 13 — 30V
- for signal “0”: -3 to +5V
- input current for signal “1”: 7mA

An assumed input voltage of 18V/7mA for signal “1” results in the following calculation:

$$R_A = \frac{24V - 18V}{7mA} = 85.14\ \Omega$$

Result: A resistance of 820 Ω will be selected.

Example 2
Connecting a relay to the open-collector output



8 Connection examples

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